

Quality Assurance Project Plan (QAPP)

QAPP Level #

Project Name

Project Number

Prepared by:

Affiliation Name

Address

Prepared for:

Missouri Department of Natural Resources

Water Protection Program

Watershed Protection Section

Approval Sheet

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How to use this template:

The template is set up in a format to guide the user. Headings and subheading are provided. Each element relates to the U.S. EPA's required elements of a QAPP. The grey text is for informational use only and should be deleted as each chapter and section is completed.

NOTE when developing a QAPP: If not specified within this QAPP, then standard operating procedures shall be developed to describe the procedures that will be followed. Any deviations from established procedures should be clearly stated within this QAPP and explained. Procedures should clearly describe: how the samples will be collected, how the sample collection procedure will be documented (e.g. chain-of-custody, sample labels, field notes), how the samples will be preserved, handled, and transported from the field to the laboratory, how the samples will be held or stored until analysis, how equipment/instruments will be used, calibrated, along with quality control procedures that will be followed for instruments and analysis, and finally, if equipment is reused, how will it be cleaned and how will you determine and document cleanliness?

To update the table of contents page: scroll into the table of contents field and right mouse click (the table of contents field will be highlighted in grey). From the pop up box chose update field. Another pop-up box will display, choose update entire table, and then press OK to update the table of contents.

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1.0 Project Management

1.1 Distribution List

This element contains individuals and their organizations that need copies of the approved QAPP and any subsequent revisions. Key personnel to consider: project manager, laboratory manager, field team leader, data processor or statistician, modeler, QA officer, data reviewers, and essential contract and subcontract personnel

Table 1. QAPP Distribution List

Name	Organization	Address	e-mail
Name, Sponsoring Agency Name, Project Manager			
Name, QA Officer			
Name, Sponsoring agency Position Title (signature authority)			
Name, MoDNR NPS Project Manager			
Trish Rielly, MoDNR NPS QAPP Manager	Missouri Department of Natural Resources	1101 Riverside Drive, Jefferson City, MO 65101	trish.rielly@dnr.mo.gov

1.2 Project/Task Organization

This element allows you to rapidly identify the roles and responsibilities of those individuals involved in the project and their organization. It quickly identifies lines of authority and reporting between the individuals and organizations.

Those individuals involved with the major aspects or phases of the project are listed here, their project responsibilities are discussed, indicating, for example, who has the authority to make changes and who is responsible for maintaining and updating the QAPP.

NOTE: The QA Officer should be independent of those that are generating project information to encourage a more objective prospective of all aspects of the project.

Including a project organizational chart in this element is extremely helpful, because it illustrates the group hierarchy.

Flow chart information may include but not limited to the following: sponsoring agency, project manager, field personnel, contract lab who will conduct chemical analysis and/or field work, chemical analysis lab supervisor, chemist, quality assurance officer, MoDNR project manager.

1.3 Problem Definition/Background

This element gives the reader an overview of the problem to be solved. It explains in detail why the project is being done by describing the problem and what you want to accomplish (e.g. your goals and objectives).

The first step will be to summarize the known information, then indicate what information is not known, but is needed to solve the problem. Next, identify the intended use of the information and those who need this information.

Note: Problems that are more complex will lead to more extensive information in this section. The reader should be able to understand the importance or context of the project.

1.4 Project/Task Description

This element is a management overview or summary of the work to be detailed in the remaining sections of the QAPP. It describes the approach taken to address the project's objectives, connecting what is needed to how it will be obtained.

In this element, summarize the specific work that will be done then reference table 2 for a summary of the project schedule. In addition, summarize what information will be collected during the project and/or data that were collected during previous studies. For example, briefly indicate the contaminants of concern (e.g. nutrients, bacteria) or chemical compounds expected to be found at the site (e.g. nutrients, bacteria), indicate number of sampling locations, and reference contaminant concentrations found during previous investigations. Summarize the measurement processes and techniques that will

be used to collect information (e.g. surface water grab samples will be collected directly into the sample container for chemical analysis. Field measurements will be collected using handheld pH, conductivity, and dissolved oxygen instruments).

Table 2. Project Study Schedule

Activity	Anticipated Date of Initiation	Anticipated Date of Completion
Enter activity or Milestone directly related to project	Enter specific date or Month and Year	Enter specific date or Month and Year
Collect monthly background samples – grab (48)	04-01-08	04-01-11
Collect bi-weekly low flow grab samples (144)	04-01-08	04-01-11
Monthly stormwater samples – composite (24)	04-01-08	04-01-11
Soil samples – composite (20)	04-01-08	09-19-08
Write conservation nutrient management plans (50)	04-01-08	09-19-09

1.5 Data Quality Objectives and Criteria for Measurement Data

This element can be written in a tabular form. The element describes quality specifications at two levels: (1) at the level of the decision or study question (table 3), and (2) at the level of the measurement used to support the decision or study question (table 4). In these tables you will supply the methodology used in the project to address data quality indicator (DQI).

Brief introductions to the tables below are necessary. Wording such as, “This section references the project data quality indicators (DQI) and is provided in table 3. below.”

Table 3. Data Quality Indicators (DQI's)

DQI	Definition	Determination Methodologies
Precision	<p>The measurement among repeated measurements of the same property under identical or substantially similar conditions; calculated as either the range or as the standard deviation.</p> <p>May also be expressed as a</p>	<p>LIST OF EXAMPLES:</p> <ul style="list-style-type: none"> – Use the same analytical instruments to make repeated analyses on the same sample. – Use the same method to make repeated

DQI	Definition	Determination Methodologies
	percentage of the mean of the measurements, such as relative range or relative standard deviation (coefficient of variation).	<p>measurements of the same sample within a single laboratory or have two or more laboratories analyze identical samples with the same method.</p> <ul style="list-style-type: none"> – Split a sample in the field and submit both for sample handling, preservation and storage, and analytical measurements. – Collect, process, and analyze collected samples for information on sample acquisition, handling, shipping, storage, preparation, and analytical process and measurements.
Bias	The systematic or persistent distortion of a measurement process that causes errors in one direction.	Use reference materials or analyze spiked matrix samples (where a known concentration added to sample and analyzed).
Accuracy	A measurement of the overall agreement of a measurement to a known value; includes a combination of random error (bias) components of both sampling and analytical operations.	Analyze a reference material or reanalyze a sample to which a material of known concentration or amount of pollutant has been added; usually expressed either as percent recovery or as a percent bias.
Representativeness	A qualitative term that expresses “the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an	Evaluate whether measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the environment or

DQI	Definition	Determination Methodologies
	environmental condition”.	condition being measured or studied.
Comparability	A qualitative term that expresses the measure of confidence that one data set can be compared to another and can be combined for the decision(s) to be made.	Compare sample collection and handling methods, such as sample preparation and analytical procedures, holding times, stability issues, and quality assurance protocols.
Completeness	A measure of the amount of valid data needed to be obtained from a measurement system.	Compare the number of valid measurements completed (samples collected or samples analyzed) with these established by the project’s quality criteria (Data Quality Objectives or performance/acceptance criteria).
Sensitivity	The capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest.	Determine the minimum concentration or attribute that can be measured by a method (method detection limit), by an instrument (instrument detection limit), or by a laboratory (quantitation limit).

Table 4. Data Quality Objectives

Parameter	Precision	Accuracy	Completeness
Enter all applicable chemical and/or biological parameters to be measured	Indicate the level of precision you need and expect to achieve for each parameter to meet your study design. <i>Generally the lowest possible detection limit of the equipment used.</i>	Indicated the level of accuracy you need and expect to achieve for each parameter to meet your study goals. <i>Generally the accuracy stated for the equipment.</i>	Indicate the minimum amount of valid data needed for each parameter in order to meet your study goals. <i>Generally, based on the total amount of samples to be collected.</i>
<i>e.g. Total Nitrogen</i>	<i>0.05 mg/L</i>	<i>± 0.01 mg/L</i>	<i>100</i>
<i>Total Phosphorus</i>	<i>0.05 mg/L</i>	<i>± 0.01 mg/L</i>	<i>100</i>
<i>pH</i>	<i>0.2 pH units</i>	<i>± 0.02 pH units</i>	<i>100</i>
<i>Dissolved Oxygen</i>	<i>0.05 mg/L</i>	<i>±0.5 mg/L</i>	<i>100</i>

Parameter	Precision	Accuracy	Completeness
<i>Temperature</i>	<i>0.1 °C</i>	<i>± 0.2°C</i>	<i>100</i>

1.6 Special Training Requirements/Certification

This element identifies any special or non-routine training or certifications that are necessary for project personnel or the laboratory to successfully complete the project.

Special training or certifications are sometimes necessary for project personnel and laboratories associated with the project.

In this element, identify the needed training/certification information. Specify what type of training will be provided, how this information will be documented, and where the training records will be kept. Indicate who is responsible for ensuring that they are met, and that the qualified personnel are available to perform the work as assigned.

1.7 Documentation and Record

This element includes information concerning the management of project's documents and records, including this QAPP and associated standard operating procedures. Management of project data is covered later in element 2.10, Data Management.

For example this element may include but not is limited to the following information:

- Description of how the most current approved quality assurance project plan will be distributed to project staff,
- List of records to be included in the data report packages for MoDNR and/or entities for review,
- List of any other project documents to be produced (e.g. standard operating procedures, field notes, etc).
- Information on the final disposition of records and documents, including storage, location, and retention schedule

In this element: Describe the process and responsibilities for making sure that project personnel will receive the most recently approved QAPP, standard operating procedures, and other documents used throughout the project. Also explain how these documents will be updated and this information communicated to personnel and other reporting entities. (Refer to the U.S. EPA Guidance for preparing Standard Operating Procedures (<http://www.epa.gov/quality/qs-docs/g6-final.pdf>).

2.0 Measurement/Data Acquisition

2.1 Sampling Process Designs (Experimental Design)

This element describes the project's data collection or experimental design. Keys to this element are to explain and/or answer the project assumptions and how the monitoring data will be obtained. This element explains the "how and why" of the monitoring design to ensure that the appropriate data are collected for this project.

A representative sample is a portion of a target population (body of water, area of soil, population) that is defined by the size of the area, shape, volume, or time that is collected. This is part of the justification for how and why the sampling site and sampling durations will be selected. A schedule for sampling and analytical activities, test runs, and reviews will be explained in this element.

To help determine the type of sampling design for your project you should address the following questions below. In addition, this will also provide you with the necessary information to determine or refine the allocation of resources for obtaining samples. Advice on selecting the appropriate design may be found in Chapter 2 of the U.S. EPA, Guidance for Choosing a Sampling Design for Environmental Data Collection (QA/G-5s) (<http://www.epa.gov/quality/qs-docs/g5s-final.pdf>).

- Will the monitoring efforts be comparable with previous sampling or analytical efforts, or with a health-based or regulatory standard?
- Can samples or measurements be taken according to a probability-based design?
- Is the objective of the sample to estimate an average or find a hot spot?
- Is there a reference or background population that can be used as a comparison to the target population?
- Will sampling sites be chosen ahead of time or in the field based on visual or other evidence; and, what are the criteria for site selection? Indicate what you would do if any sampling locations become inaccessible.
- Will you use a network of sampling sites that will be visited periodically or will sampling be performed continuously, by event occurrence or seasonally?
- Do all the samples need to be taken simultaneously?
- Is the target population approximately homogeneous (the same) or is it heterogeneous (different) in nature needing stratification or division into approximately homogeneous areas?
- Can samples be composited or should they be kept separate?

Also in this element you will need to explain in detail the sampling plan or methodology and should include the following information:

- Number of samples
- How many sampling locations
- Number of samples (composite/grab) at each location
- Support for the sample (the area or part of the target population that a single sample is suppose to represent),
- Number of QC samples (field replicates, duplicates, etc.) and frequency of collection (e.g. every 10th sample or 10% of the total number of samples collected)
- Your plan for obtaining replacement samples essential to the integrity of the project and to meet your study goals.

You should also briefly describe how samples will be collected, treated, and handled before shipping or deliver to the laboratory for analysis. This will be described in more detail in later elements. Include information identifying the role of any potential sources of variability which would affect the sampling period, such as seasonal differences and rainfall events.

2.2 Sampling Methods Requirements

This element details how samples or information will be collected consistently between locations and by all sampling teams, with no contamination being introduced during collection.

If specific procedures are not specified within this QAPP, then standard operating procedures shall be developed to describe the procedures that will be followed. Any deviations from established procedures should be clearly stated and explained. Procedures should clearly describe: how the samples will be collected, how the sample collection procedure will be documented (e.g. chain-of-custody, sample labels, field notes), how the samples will be preserved, handled, and transported from the field to the laboratory, how the samples will be held or stored until analysis, how equipment/instruments will used, calibrated, along with quality control procedures that will be followed for instruments and analysis, and finally, if equipment is reused, how will it be cleaned and how will you determine and document cleanliness?

This element should explain the following and reference the summary table below (table 5): For each type of sample (soil, water, etc.), describe what constitutes a sample, that is, how much sample is needed (e.g. sample volume), what types of sample container(s) will be used, how samples will be collected, and whether any sample is to be split in the field, composited, or sub-samples taken. If any of these samples will homogenized (separate samples mixed together to make one sample), composited, or split, also indicated how this will be accomplished. Reference or attach any standard operation procedures or thoroughly explain the methods in this QAPP.

For continuous monitoring, indicate the how the data will be collected by the instrument. Explain if the instrument(s) will collect instantaneous measurements or average data points over a predetermined time, and whether the instrument(s) will store and maintain all the raw data or only the data averages over that time. In addition, indicate how the data will be averaged, stored, downloaded, reported, etc.

Also explain and/or identify any potential limitations and specific performance criteria. If nonstandard methods or unusual equipment are to be used, indicate the rationale for their use and describe validation studies to confirm the performance of the method for that particular matrix and justify their use. Also state the precision, accuracy, and detection limits that will be adequate for the intended use of the data.

List what sampling equipment is needed and appropriate for the project and what support facilities are to be used (e.g. flat bottom boat, plastic or stainless steel bucket, Ponar dredge, submersible pump, etc.).

Indicate your backup plan for when things go wrong. This may be a generic statement about obtaining backup supplies or equipment. Indicate how this information will be communicated to management, identify who is responsible for corrective action, and describe how corrective action will be documented.

Indicate whether monitoring equipment and samplers, will be cleaned and/or decontaminated. Detail how this will be done to ensure that there is no carryover from one sampling location to the next. Remember to include information on how decontamination by-products will be disposed, in accordance with local, state and federal regulations.

This element should also include the information that will be written in field notebook (e.g. sample date and time, sample collector, weather conditions, description of sample location, sample characteristics, sample number, field measurements and instrument field calibration data), sample tag/label information (e.g. sample number, sampling date and time (24 hrs), sample type (water, soil,), chemical preservative used, sample collector initials). This information should match the information written on the Chain-of-Custody form (e.g. sample number, sampling data and time (24 hrs), sample type, preservation, sample collector and affiliation, sample collection location, analytical parameters, field measurements and units).

Table 5. Summary of Sampling Procedures

Parameter	Sample Matrix	Sampling Frequency	Sampling Method	Sample Container	Sample Volume	Sample Holding Time
Enter all applicable chemical and/or	Indicate the type of matrix to be	Indicate how often the samples will be collected	Describe and/or cite sampling methods	Describe the sample containers to be used	Indicate the volume of sample needed for	Indicate the maximum holding time for

biological parameters to be measured	sampled or tested for each parameter (e.g. soil, water, air)	or field measurements will be taken for each parameter	to be used for each parameter and/or sampling equipment or instrument make and model to be used	for each parameter or “NA” or <i>in-situ</i> for those to be measured on-site with field instruments	analysis of each parameter or “NA” or <i>in-situ</i> for those measured on-site with field instruments	each parameter or “NA” or <i>in-situ</i> for those to be measured on-site with field instruments.
E. coli	Water	Bi-weekly	IDEXX – Colilert 97 Well Quanti tray method	P – Sterile 120 mL bottle	150 ml	6-hours
Total Phosphorus	Water	Bi-weekly	Hach method # XXXX	Determined on-site	Determined on-site	Determined on-site
Total Nitrogen as N	Water	Bi-weekly	Hach method # XXXX	Determined on-site	Determined on-site	Determined on-site
pH	Water	Bi-weekly	Hach pocket pen, model # XXX	Determined on-site	In-situ	In-situ
Dissolved Oxygen	Water	Bi-weekly	YSI Meter, Model #	Determined on-site	In-situ	In-situ
Temperature	Water	Bi-weekly	Alcohol filled NIST traceable	Determined on-site	In-situ	In-situ

P= plastic, G=glass

2.3 Sample Handling and Custody Requirements

This element describes your efforts to have each sample retain its original physical form and chemical composition from collection to final disposal.

In this element, describe the steps taken to ensure the samples keep their original condition during sample collection, transportation, and storage. The steps may include the use of chemical preservatives (such as the addition of acid to the sample container) and/or keeping the sample cool (e.g. stored on ice or refrigerated) during transport, using the appropriate packing material, and noting whether the sample will be kept refrigerated or frozen for long-term storage. If standard operating procedures have been developed, reference the procedure and attach as appendix of QAPP. If written procedure has not been established, then clearly explain the procedure here.

In this element you need to provide the maximum holding times of each sample which should also be noted in Table 5 above. Holding times will vary with the analyte/matrix and are designed to ensure stability of the analyte/sample. Refer to the U.S. EPA's Methods for Chemical Analysis of Water and Waste (EPA/600/4-79/020 (<http://h2o.enr.state.nc.us/lab/qa/epamethods/EPA600479020.pdf>) for additional information.

List who will maintain the field notebooks and who is responsible for sample custody in the field, and receipt of sample, custody, and ultimate disposal in the laboratory. For example, does the laboratory have a sample receipt department, or will the sample be given directly to the analyst? Will the analyst use the entire sample during analysis or will a portion be held for future reference?

Chain-of-Custody document can be considered as part of a quality control procedure and often a legal document that enable tracing the possession and handling of a sample during transfer so that its physical possession is known at all points of the project. Custody documents may include field sheet, sample tags/labels, and/or documentation that is signed by each person who handles the samples. The custody procedure should be described fully within the QAPP or reference a standard operating procedure attached as an appendix to QAPP.

2.4 Analytical Methods Requirements

This element identifies the procedures to analyze samples, and the level and quality of the procedure needed to support any decisions to be made with the data.

Cite the analytical standard operating procedures (if available) and include them as appendices to the QAPP. You may also reference Table 6 for a summary of the analytical procedures to be followed. If standard operating procedures have not been developed for the analysis, clearly explain the procedures in this QAPP. If a U.S. EPA standard method is to be followed, cite the method number and date the method was approved. In this element you should describe and justify any deviations or modifications to any established procedure or method. If the laboratory is using a

nonstandard or unapproved method, provide method validation data to justify its use and confirm that it will be adequate for the intended use of the data.

Also include any specific method performance specifications. If no method currently exists for the analysis needed, method performance criteria to analyze the parameter should be discussed here.

Identify the steps to be followed when problems arise.

Table 6. Summary of Analytical Procedures

Parameter	Analytical Method	Performance Range or Detection Limit	Reporting Units
Enter all applicable chemical and/or biological parameters to be measured	Describe or cite the method and/or equipment used to analyze samples and/or measure each parameter. If using electronic field instruments, include the make and model of each instrument	Indicate the range of measurements over which you can expect to achieve accurate results for each method to be used, or “N/A” if performance range is not quantifiable	Enter units of measurement for each parameter
E. coli	IDEXX – Colilert 97 Well Quanti tray method	<1 - >2419.	Colonies/100 mL
Total phosphorus	EPA Method # XXX.XX	0.05 – 3.00	mg/L
Total Nitrogen as Nitrogen	EPA Method # XXX.XX	0.05 – 3.00	mg/L

2.5 Quality Control Requirements

There is potential variability in any sample collection, analysis, or measurement activity, with field variability generally contributing more than laboratory variability.

Quality control activities are those technical activities routinely performed through a monitoring event both in the field and in the laboratory setting. The actual quality control data needs are based on the decisions to be made and the data quality specifications previously stated for the project. Here you should list all the checks you are going to follow to assess/demonstrate the reliability and confidence in the data collected. This element should also state who is responsible for conducting these activities. Any established field and laboratory procedures should be attach to appendix of the QAPP. The quality control information can also be summarized in Table 7 below.

Table 7. Summary of Quality Control Procedures

Quality Control Procedure	Field Procedure (Yes/No)	Laboratory Procedure (Yes/No)	Frequency
Describe all the measures to be taken in the field and/or laboratory to ensure that the data quality objectives are met			Indicate when and/or how often during the study each procedure will be performed
Duplicates	Y	Y	Every 10 th sample
Replicates	N	Y	Every 10 th sample
Spiked Matrix	N	Y	Every sample batch
Equipment blank	Y	N	One container from every batch pre-cleaned
Field blank	Y	N	Every 10 th sample

2.6 Instrument/Equipment Testing Inspection and Maintenance Requirements

This element describes how project personnel will know that the equipment will work properly in the field or laboratory setting.

In this element, list any equipment or systems that will be used during the project that should be inspected or tested before use, or what maintenance is conducted on a routine basis. Describe what will be done to test, inspect, and maintain the project's instruments and equipment, and identify where critical spare parts will be located. Indicate also, how often this will be done and who is responsible for doing it. If a standard operating procedure has been developed then reference the procedure here and attach standard as

appendix of QAPP. If written procedure is not available then clearly describe the procedure here.

2.7 Instrument Calibration and Frequency

This element identifies how you will ensure continual quality performance of any equipment and instruments used in the project.

In this element, list any equipment and instruments needing calibration either in the field, in the fixed laboratory, or in the office. Also include how often calibration will need to be done and any instances where calibration should be done beyond routine and scheduled calibration. Identify any applicable criteria and measurement and testing equipment that will be used. In addition, you should list who is responsible for calibrating instruments and equipment.

Specific test methods should be discussed, and reference and attach standard operating procedure in appendix.

Calibration information for each equipment and instrument type can also be summarized in a table and referenced from text.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables

Not all projects will need supplies or consumables considered as “critical” to the project. This element documents your system for having the right critical field and laboratory supplies and consumables available through out project.

Here you should identify what project supplies are critical, and who is responsible to make sure they are available. Where applicable, document the information so that these supplies can be located and similar items purchased when the listed items are exhausted.

2.9 Data Acquisition Requirements (non-direct Measurements)

This element addresses data obtained from existing data sources, not directly measured or generated in this project. In addition to listing the information to be obtained, discuss your intended use of that information.

Data to be identified may be qualitative or quantitative in nature and consisting of existing sampling or analytical data, photographs or maps, published literature, background information obtained from facility or state files, or meteorological data.

If you have not decided upon the sources of data you will use, document the process that you will use to identify these sources and select data specify data types, and explain how you will acquire the data. Then describe how the data will be used either exclusively or in combination with newly collected data.

2.10 Data Management

This element gives an overview of the management of the data generated throughout the project.

In this element, identify the process, hardware equipment, and software you will use for data/information handling and storage throughout the life of the project.

For example this element may include but not limited to the following information:

- Description the project data management process;
- Description of or reference to the office's standard record-keeping procedures and document control, data storage, retrieval, and security systems;
- Identification of data handling equipment and procedures to process, compile, and analyze project data;
- Discussion of data handling procedures to detect and correct errors and loss during data processing;
- Examples of forms and checklists to be used, identification of any specific computer hardware/software performance requirements and how configuration acceptability will be determined;
- Description of how applicable information resource management requirement(s) will be satisfied.

3.0 Assessment/Oversight

3.1 Assessments and Response Action

This element gives information concerning how a project's activities will be assessed during the project to ensure that the QAPP is being implemented as approved.

A wide variety of internal and external assessments can be conducted during a project to ensure that QAPP is being followed (e.g. field and laboratory audits, proficiency testing, data management activities). The types of assessments to be conducted, and the frequency for conducting these assessments, will depend on the intended use of the data, and the confidence level and expectation of the quality of the data generated.

Assessments are best done throughout the project to identify potential problems early in the project to allow for timely corrective action. Assessments should be considered as a routine part of the project, rather than being conducted "as needed". In this element discuss the type of assessment, the frequency of assessment, who will be conducting the assessment, and their authority to report and/or stop work activities.

3.2 Reports to Management

This element documents how management (sponsoring agency authority and MoDNR 319 project manager) will be kept informed of the project progress, assessment activities, and findings.

In this element, identify what project status reports will be written during the project. These might include; quarterly or final assessment reports to MoDNR 319 project manager, results of proficiency test samples, calibration reports, and model evaluation reports to sponsoring agency authority and/or MoDNR 319 project manager. Indicate who will be responsible for writing these reports, when and how often these reports will be written, and identify who will be notified of audit findings (e.g. semi-annual summary report).

4.0 Data Validation and Usability

4.1 Data Review, Validation, and Verification Requirements

This element lists your criteria for deciding to accept, reject, or qualify project data and information to be obtained. In this element, list the final critical checks that will be done on the information obtained during the project. These final checks will determine whether they satisfy the data/information criteria chosen for this project and whether that information can be used.

For example, you will determine: how much data is needed to make accurate assessment, what are the limits of the data, and decide what will be done with data outliers.

Data review portion is the examination of the projects procedures to ensure the data/information have been recorded, transmitted, and processed correctly. Data review includes checking data entry, transcription, calculation, reduction, and transformation errors.

4.2 Validation and Verification Methods

This element identifies the processes for verifying then validating project information. Data verification is the process for evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual specifications to determine the quality of a specific data set relative to the end use.

Much information previously listed in the other elements will be discussed here for the series of final checks on the data that will be conducted. The data may be reviewed to verify how it was:

- Recorded or formatted
- Transformed or reduced
- Transferred from software
- Analyzed
- Qualified

In this element, who will be responsible for the quality control and the final reporting of the data? Explain the process of how errors will be handled and how this information will be given to the data users.

4.3 Reconciliation with Data Quality Objectives

This element describes how you will evaluate the validated data to see if it answers the projects data quality objectives. This is the final assessment of the data quality and the culmination of the entire quality assurance process for the project.

If statistical methods are to be used you will need to explain what statistical analysis method will be used, formulas used to determine trends, anomalies, and/or relationships. If using raw data with no statistical analysis, then it needs to be explained how the data is to be used to make decisions.

Describe in this element what statistical analyses or error estimates will be made based on the total error. This may involve some statistical analyses such as tests for outliers, trends, dispersion, etc. or a scientific evaluation of the information. Describe how data will be presented (tables, charts) to illustrate trends, relationships, and anomalies.

Discuss how limitations on the use of the data will be handled and reported to the decision makers. For example, what will be done if data quality indicators do not meet performance criteria? Also discuss how much of this information will be included in the final project report.

List of References (if applicable)

For example:

- EPA documents or methods
- Standard operating procedures
- Journal articles or manuals that were used to discuss the problem or procedure or method followed in QAPP

Appendices

Appendix 1 Attach Site maps and Site photos

Attach map of watershed and sampling locations

Appendix 2
Attach Chain of Custody Form
Field sheets/forms
Laboratory bench sheets
other documentation forms

Appendix 3 Attach Standard Operating Procedures

Examples:

- Sample collection procedure
- Sample documentation procedure
- Sample analysis procedure
- Instrument/equipment calibration, use, maintenance, cleaning and required quality control checks procedures